

关键参数		Key Parameters	
V_{CES}		3300	V
$V_{CE(sat)}$	Typ.	2.60	V
I_C	Max.	1500	A
$I_{C(RM)}$	Max.	3000	A

典型应用	Typical Applications
● 牵引传动	Traction Drives
● 电机控制	Motor Controllers
● 智能电网	Smart Grid
● 高可靠性逆变器	High Reliability Inverters

特点	Features
● AISiC 基板	AISiC Baseplate
● AIN 衬板	AIN Substrates
● 高热循环能力	High Thermal Cycling Capability
● 10μs 短路承受能力	10μs Short Circuit Withstand

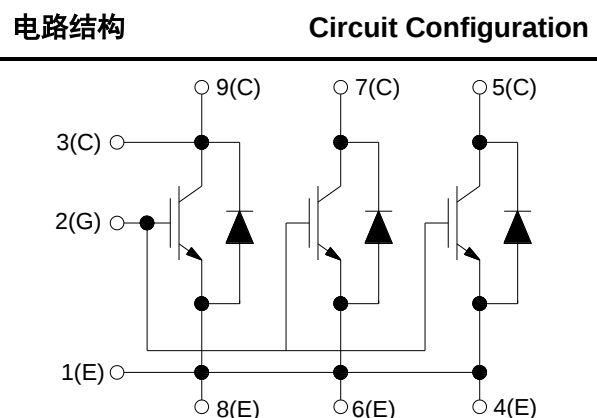


图 1. 电路结构

Fig. 1 Circuit configuration

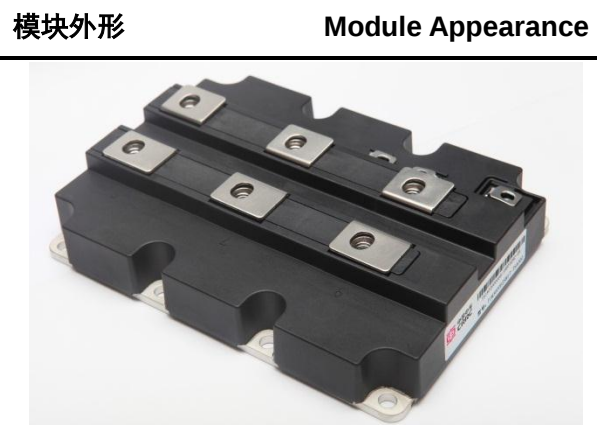


图 2. 模块外形

Fig. 2 Module appearance

模块标签说明	Module Label Code Instruction	
 ab1234567890	数据位置	数据内容
	Data position	Content of data
	1--8	模块批次号 Module batch number
	9--12	模块序列号 Module serial number

最大额定值
Absolute Maximum Ratings

符号 Symbol	参数名称 Parameter	测试条件 Test Conditions	数值 Value	单位 Unit
V_{CES}	集电极-发射极电压 Collector-emitter voltage	$V_{GE} = 0V, T_C = 25\text{ }^{\circ}\text{C}$	3300	V
V_{GES}	栅极-发射极电压 Gate-emitter voltage	$T_C = 25\text{ }^{\circ}\text{C}$	± 20	V
I_C	集电极电流 Collector-emitter current	$T_C = 95\text{ }^{\circ}\text{C}$	1500	A
$I_{C(RM)}$	集电极峰值电流 Peak collector current	$t_P = 1\text{ms}$	3000	A
P_{max}	晶体管部分最大损耗 Max. transistor power dissipation	$T_{vj} = 150\text{ }^{\circ}\text{C}, T_C = 25\text{ }^{\circ}\text{C}$	14.8	kW
I^2t	二极管 I^2t 值 Diode I^2t	$V_R = 0V, t_P = 10\text{ms}, T_{vj} = 150\text{ }^{\circ}\text{C}$	720	kA^2s
V_{isol}	绝缘电压(模块) Isolation voltage – per module	短接所有端子，端子与基板间施加电压 (Connected terminals to base plate), AC RMS, 1 min, 50Hz, $T_C = 25\text{ }^{\circ}\text{C}$	6000	V
Q_{PD}	局部放电电荷(模块) Partial discharge – per module	IEC1287. $V_1 = 3500V, V_2 = 2600V, 50\text{Hz RMS}$	10	pC

热和机械数据
Thermal & Mechanical Data

参数 Symbol	说明 Explanation	值 Value	单位 Unit
爬电距离 Creepage distance	端子-散热器 Terminal to heatsink	33.0	mm
	端子-端子 Terminal to terminal	34.0	mm
绝缘间隙 Clearance	端子-散热器 Terminal to heatsink	20.0	mm
	端子-端子 Terminal to terminal	20.0	mm
相对漏电起痕指数 CTI (Comparative Tracking Index)		>600	

热和机械数据
Thermal & Mechanical Data

符号 Symbol	参数名称 Parameter	测试条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
$R_{th(J-C) IGBT}$	IGBT 结壳热阻 Thermal resistance – IGBT				8.4	K / kW
$R_{th(J-C) Diode}$	二极管结壳热阻 Thermal resistance – Diode				12.8	K / kW
$R_{th(C-H)}$	接触热阻(模块) Thermal resistance – case to heatsink (per module)	安装力矩 5Nm, 导热脂 1W/m·K Mounting torque 5Nm, with mounting grease 1W/m·K		6		K / kW
$T_{vj op}$	工作结温 Operating junction temperature	IGBT 芯片(IGBT)	-40		150	°C
		二极管芯片(Diode)	-40		150	°C
T_{stg}	存储温度 Storage temperature range		-40		150	°C
M	安装力矩 Screw torque	安装紧固用 – M6 Mounting – M6			5	Nm
		电路互连用 – M4 Electrical connections – M4			2	Nm
		电路互连用 - M8 Electrical connections – M8			10	Nm

电特性值
Electrical Characteristics

 除非特别声明，否则 $T_C = 25\text{ }^{\circ}\text{C}$
 $T_C = 25\text{ }^{\circ}\text{C}$ unless otherwise stated

符号 Symbol	参数名称 Parameter	条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
I_{CES}	集电极截止电流 Collector cut-off current	$V_{GE} = 0V, V_{CE} = V_{CES}$			1	mA
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_{vj} = 125\text{ }^{\circ}\text{C}$			90	mA
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_{vj} = 150\text{ }^{\circ}\text{C}$			150	mA
I_{GES}	栅极漏电流 Gate leakage current	$V_{GE} = \pm 20V, V_{CE} = 0V$			1	μA
$V_{GE(th)}$	栅极-发射极阈值电压 Gate threshold voltage	$I_C = 120\text{mA}, V_{GE} = V_{CE}$	5.40	6.00	6.60	V
$V_{CE(sat)}^{(*1)}$	集电极-发射极饱和电压 Collector-emitter saturation voltage	$V_{GE} = 15V, I_C = 1500A$		2.60	3.00	V
		$V_{GE} = 15V, I_C = 1500A, T_{vj} = 125\text{ }^{\circ}\text{C}$		3.15		V
		$V_{GE} = 15V, I_C = 1500A, T_{vj} = 150\text{ }^{\circ}\text{C}$		3.30		V
I_F	二极管正向直流电流 Diode forward current	DC		1500		A
I_{FRM}	二极管正向重复峰值电流 Diode peak forward current	$t_p = 1\text{ms}$		3000		A
$V_F^{(*1)}$	二极管正向电压 Diode forward voltage	$I_F = 1500A, V_{GE} = 0V$		2.00	2.40	V
		$I_F = 1500A, V_{GE} = 0V, T_{vj} = 125\text{ }^{\circ}\text{C}$		2.15		V
		$I_F = 1500A, V_{GE} = 0V, T_{vj} = 150\text{ }^{\circ}\text{C}$		2.15		V
I_{SC}	短路电流 Short circuit current	$T_{vj} = 150\text{ }^{\circ}\text{C}, V_{CC} = 2500V,$ $V_{GE} \leq 15V, t_p \leq 10\mu\text{s},$ $V_{CE(max)} = V_{CES} - L^{(*2)} \times di/dt,$ IEC 60747-9		6700		A

注意: 1. (*1) 表示该参数的测试点为辅助母排端子 (*1) indicates it is measured at the auxiliary busbar terminal),
Note: 2. (*2) 表示 L 是电路杂散电感加上 L_{sCE} (*2) indicates L is the circuit stray inductance plus L_M).

电特性值

Electrical Characteristics

除非特别声明，否则 $T_C = 25\text{ }^{\circ}\text{C}$ $T_C = 25\text{ }^{\circ}\text{C}$ unless otherwise stated

符号 Symbol	参数名称 Parameter	条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
C_{ies}	输入电容 Input capacitance	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 100\text{kHz}$		158		nF
Q_g	栅极电荷 Gate charge	$\pm 15\text{V}$		14		μC
C_{res}	反向传输电容 Reverse transfer capacitance	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 100\text{kHz}$		3.7		nF
L_{sCE}	模块杂散电感 Module stray inductance			5		nH
$R_{CC'+EE'}$	模块引线电阻，端子-芯片 Module lead resistance, terminal-chip			140		$\mu\Omega$

电特性值
Electrical Characteristics

符号 Symbol	参数名称 Parameter	测试条件 Test Conditions		最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
$t_{d(off)}$	关断延迟时间 Turn-off delay time	$I_C = 1500A$, $V_{CE} = 1800V$, $V_{GE} = \pm 15V$, $R_{G(OFF)} = 1.5\Omega$ $C_{GE} = 330nF$, $L_S = 180nH$, $dv/dt = 4700V/\mu s$ ($T_{vj} = 150^\circ C$).	$T_{vj} = 25^\circ C$		2450		ns
			$T_{vj} = 125^\circ C$		2530		
			$T_{vj} = 150^\circ C$		2550		
t_f	下降时间 Fall time		$T_{vj} = 25^\circ C$		1300		ns
			$T_{vj} = 125^\circ C$		2050		
			$T_{vj} = 150^\circ C$		2260		
E_{OFF}	关断损耗 Turn-off energy loss		$T_{vj} = 25^\circ C$		2365		mJ
			$T_{vj} = 125^\circ C$		2930		
			$T_{vj} = 150^\circ C$		3100		
$t_{d(on)}$	开通延迟时间 Turn-on delay time	$T_{vj} = 25^\circ C$		550		ns	
		$T_{vj} = 125^\circ C$		585			
		$T_{vj} = 150^\circ C$		585			
t_r	上升时间 Rise time	$T_{vj} = 25^\circ C$		355		ns	
		$T_{vj} = 125^\circ C$		363			
		$T_{vj} = 150^\circ C$		370			
E_{ON}	开通损耗 Turn-on energy loss	$T_{vj} = 25^\circ C$		1360		mJ	
		$T_{vj} = 125^\circ C$		1730			
		$T_{vj} = 150^\circ C$		2000			
Q_{rr}	二极管反向恢复电荷 Diode reverse recovery charge	$T_{vj} = 25^\circ C$		1130		μC	
		$T_{vj} = 125^\circ C$		1700			
		$T_{vj} = 150^\circ C$		1950			
I_{rr}	二极管反向恢复电流 Diode reverse recovery current	$T_{vj} = 25^\circ C$		1460		A	
		$T_{vj} = 125^\circ C$		1580			
		$T_{vj} = 150^\circ C$		1660			
E_{rec}	二极管反向恢复损耗 Diode reverse recovery energy	$T_{vj} = 25^\circ C$		1490		mJ	
		$T_{vj} = 125^\circ C$		2310			
		$T_{vj} = 150^\circ C$		2700			

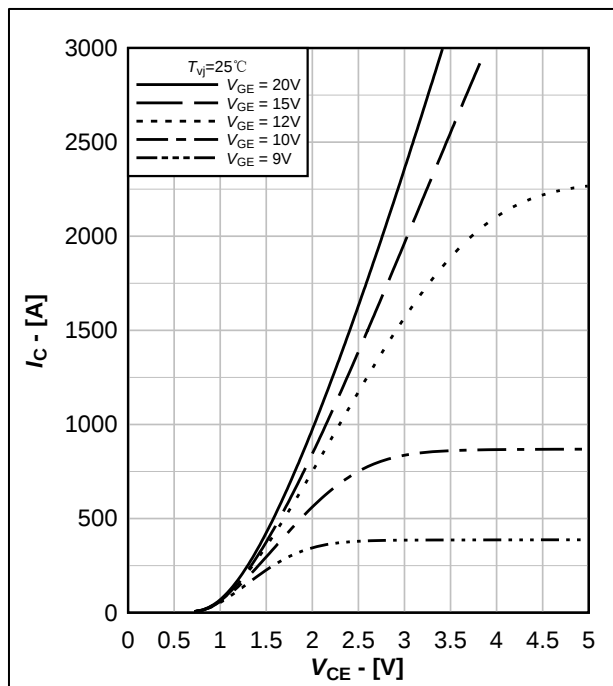

图 3. IGBT 输出特性典型曲线, $I_C = f(V_{CE})$

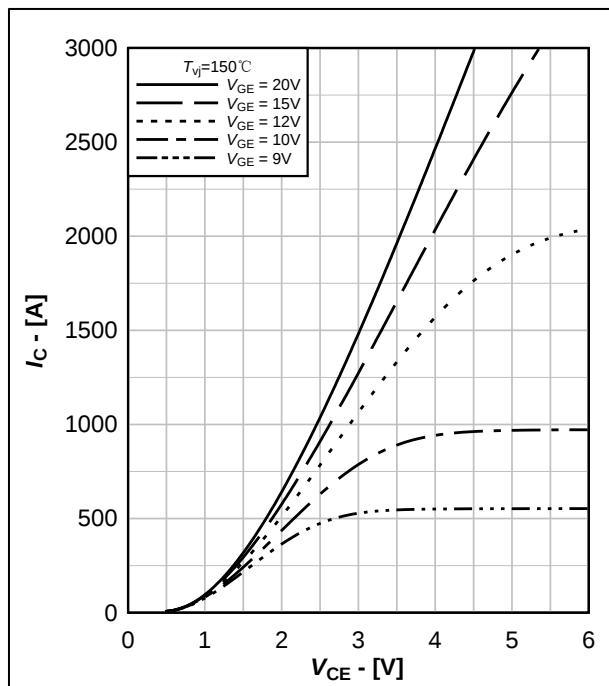
Fig.3 Typical IGBT output characteristics, $I_C = f(V_{CE})$

图 4. IGBT 输出特性典型曲线, $I_C = f(V_{CE})$

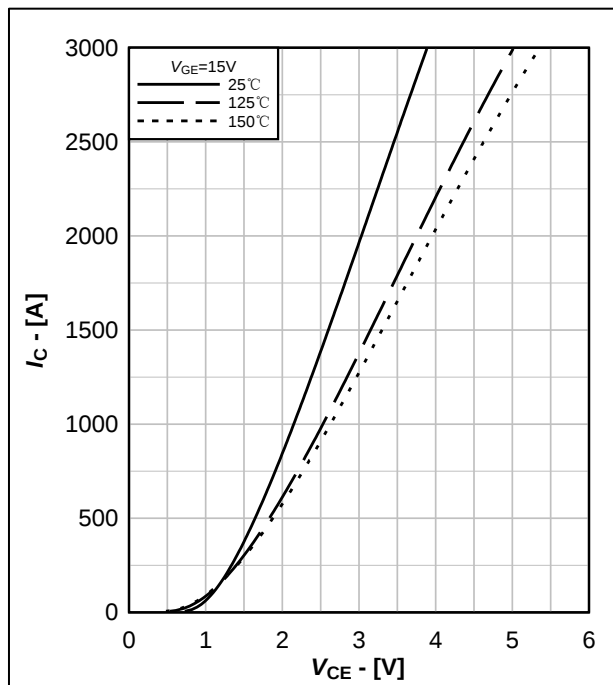
Fig.4 Typical IGBT output characteristics, $I_C = f(V_{CE})$

图 5. IGBT 输出特性典型曲线, $I_C = f(V_{CE})$

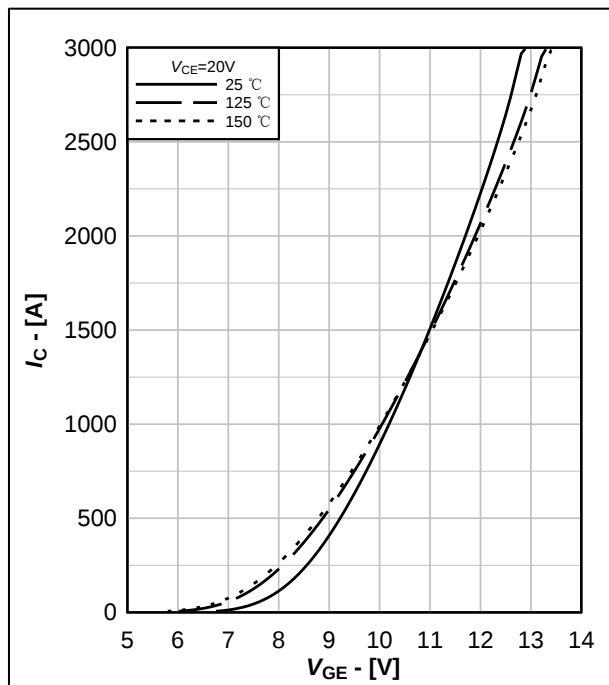
Fig.5 Typical IGBT output characteristics, $I_C = f(V_{CE})$

图 6. IGBT 传输特性典型曲线, $I_C = f(V_{GE})$

Fig.6 Typical IGBT transfer characteristics, $I_C = f(V_{GE})$

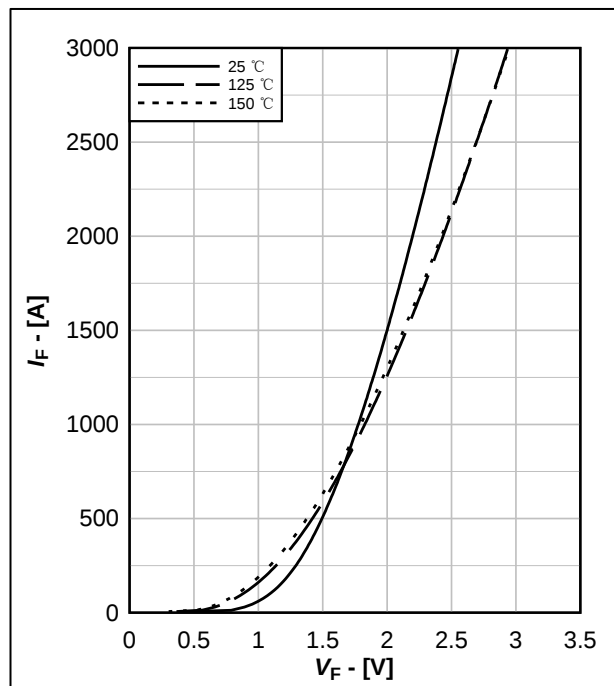

图 7. FRD 输出特性典型曲线, $I_F = f(V_F)$

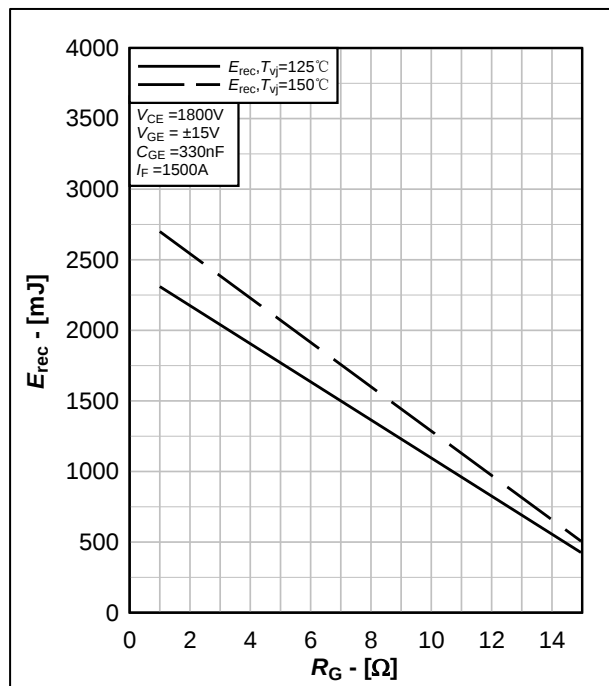
Fig.7 Typical FRD output characteristics, $I_F = f(V_F)$

图 8. FRD 反向恢复损耗典型曲线, $E_{rec} = f(R_G)$

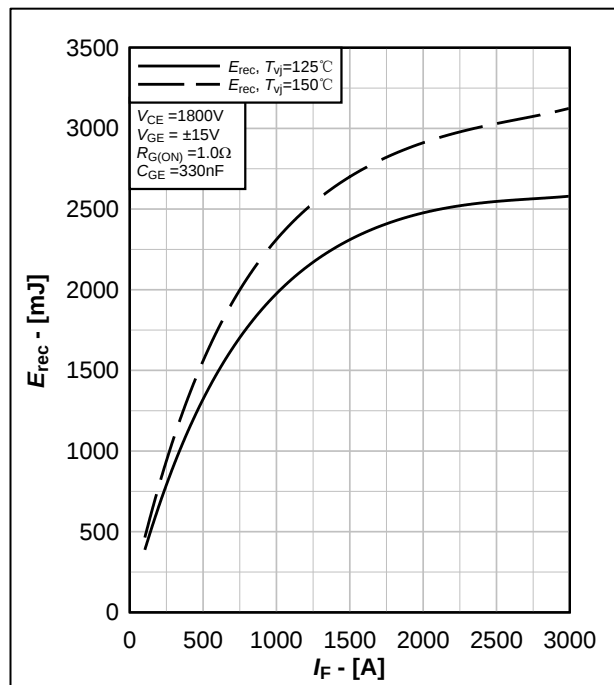
Fig.8 Typical FRD switching loss E_{rec} , $E_{rec} = f(R_G)$

图 9. FRD 反向恢复损耗典型曲线, $E_{rec} = f(I_F)$

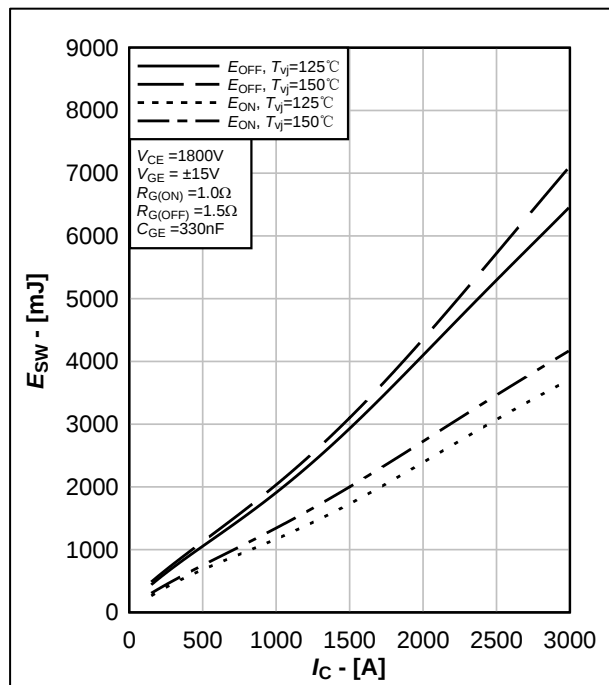
Fig.9 Typical FRD switching loss E_{rec} , $E_{rec} = f(I_F)$

图 10. IGBT 开关损耗典型曲线, $E_{on} = f(I_C)$, $E_{off} = f(I_C)$

Fig.10 Typical IGBT switching loss, $E_{on} = f(I_C)$, $E_{off} = f(I_C)$

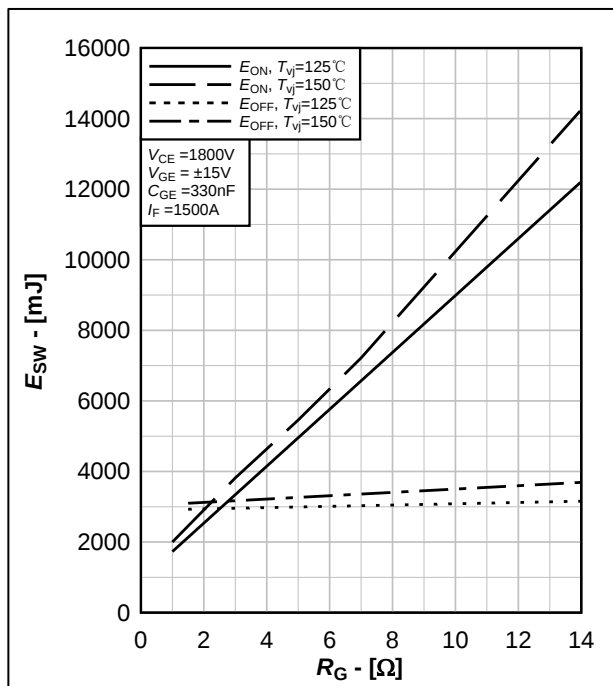

图 11. IGBT 开关损耗典型曲线, $E_{on}=f(R_G)$, $E_{off}=f(R_G)$

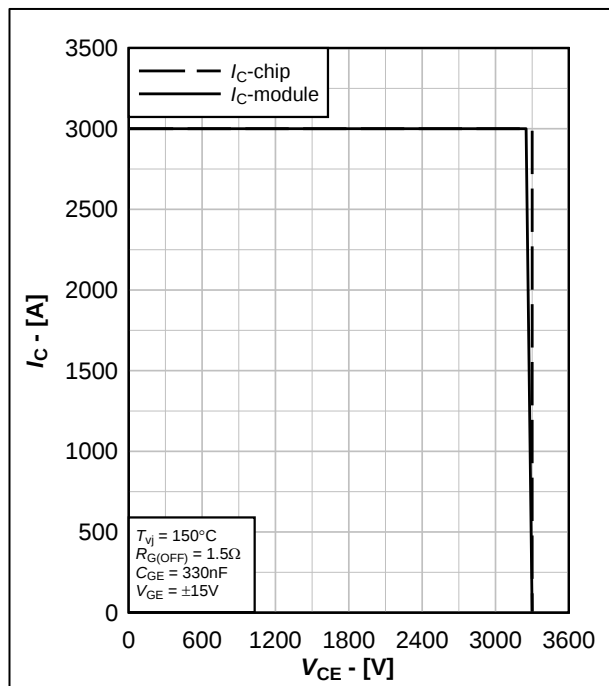
Fig.11 Typical IGBT switching loss, $E_{on}=f(R_G)$, $E_{off}=f(R_G)$

图 12. IGBT 反偏安全工作区, $I_C=f(V_{CE})$

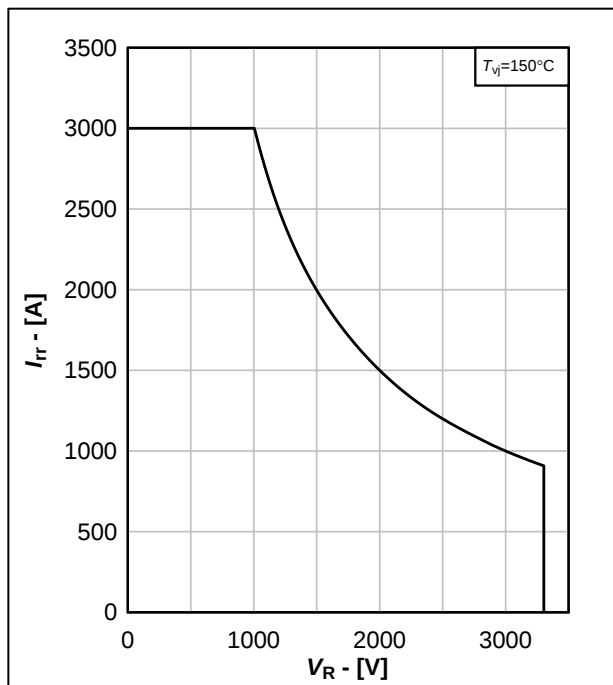
Fig.12 Reverse bias safe operating area of IGBT, $I_C=f(V_{CE})$

图 13. FRD 反偏安全工作区, $I_{rr}=f(V_R)$

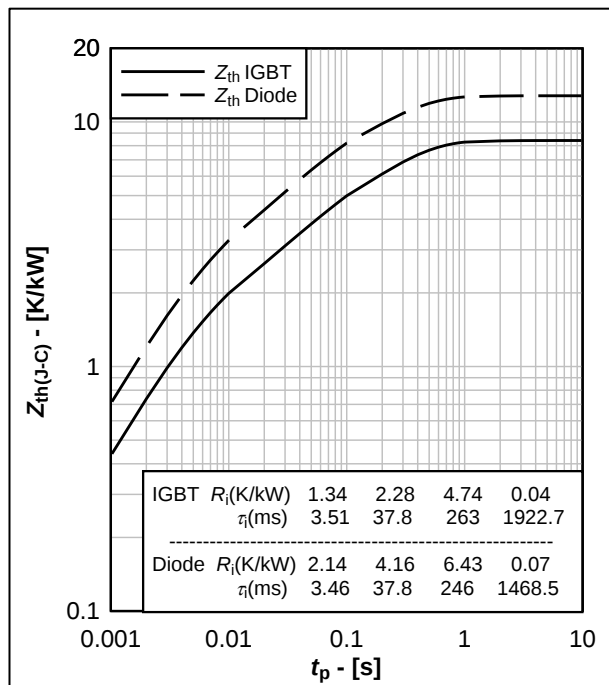
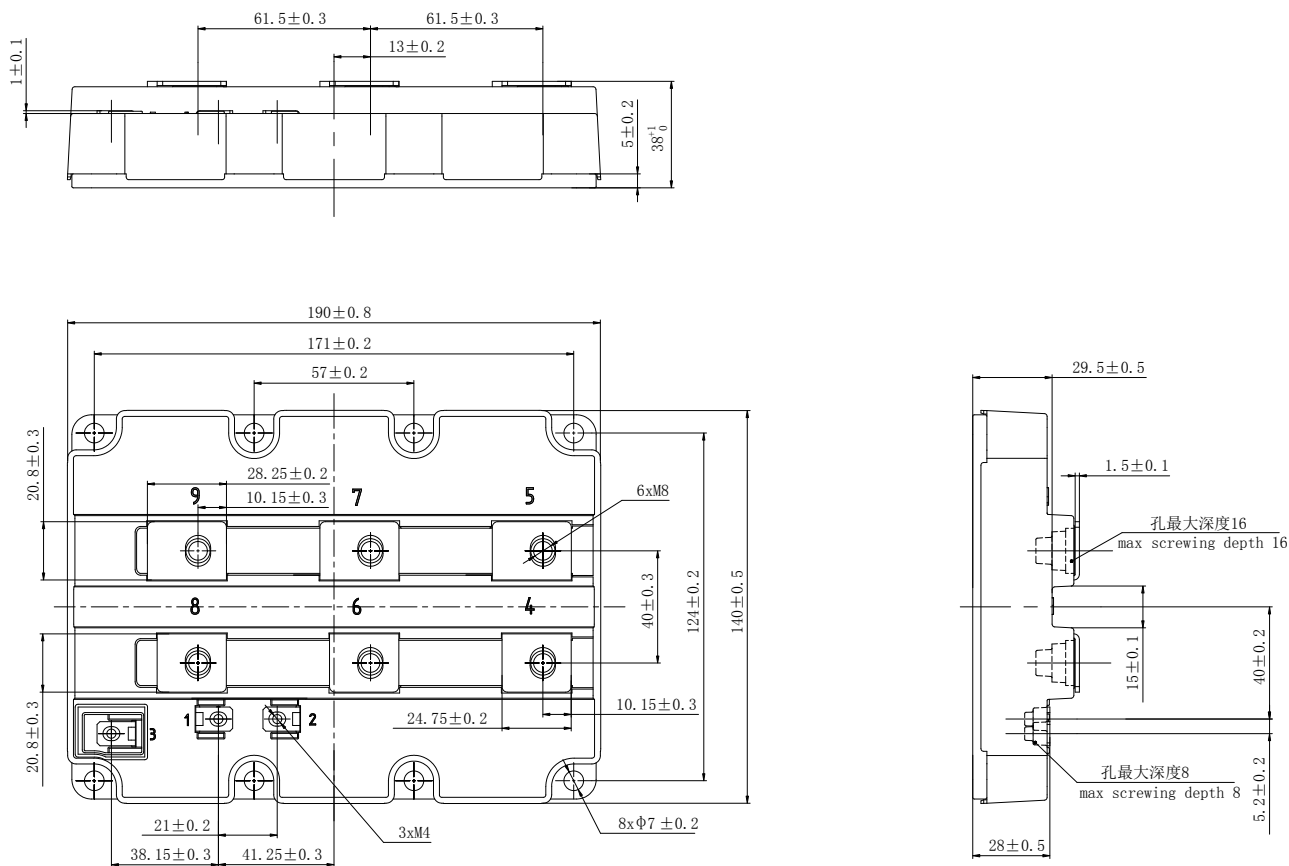
Fig.13 Reverse bias safe operating area of FRD, $I_{rr}=f(V_R)$

图 14. 瞬态热阻抗曲线, $Z_{th(j-c)}=f(t_p)$

Fig.14 Transient thermal impedance, $Z_{th(j-c)}=f(t_p)$



重量 Weight: 1100g 模块外观类型 Module outline code: E2

图 15. 模块外观尺寸

Fig. 15 Module outlines

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